

## ABSTRACT OF THE DISCLOSURE

A pressure swing adsorption process including the step of separating a gas mixture by absorbing a gas component in adsorbent beds provided within vessels, where the separating step has at least a two-stage pressure equalization and is performed with no more than five valves per vessel of the plurality of vessels. The process includes an adsorption step, a first pressure equalization step having at least two stages where the pressure decreases, a purge step, and a second pressure equalization step having at least two stages where the pressure increases. A pressure swing adsorption system is provided with vessels each having a first opening connected to a source manifold via a first valve and connected to a waste manifold via a second valve, and a second opening connected to a product manifold via a third valve and connected to an equalization conduit via a fourth valve and a fifth valve.

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